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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2018-1016; Special Conditions No. 25-753-SC]

Special Conditions: The Boeing Company Model 777-9 Airplane; Electronic Flight-Control System and Control-Surface-Position Awareness.

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for The Boeing Company (Boeing) Model 777-9 airplane. This airplane will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. This design feature is an electronic flight-control system requiring control-surface-position awareness. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: Effective [INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

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SUPPLEMENTARY INFORMATION:

Background

On December 6, 2013, Boeing applied for an amendment to Type Certificate No. T00001SE to include the new 777-9 airplane. This airplane, which is a derivative of the Boeing Model 777 airplane currently approved under Type Certificate No. T00001SE, is a twin-engine, transport-category airplane with seating for 495 passengers and a maximum takeoff weight of 775,000 pounds.

Type Certification Basis

Under the provisions of title 14, Code of Federal Regulations (14 CFR) 21.101, Boeing must show that the Model 777-9 airplane meets the applicable provisions of the regulations listed in Type Certificate No. T00001SE, or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Boeing Model 777-9 airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel

or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Boeing Model 777-9 airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

Novel or Unusual Design Features

The Boeing Model 777-9 airplane will incorporate the following novel or unusual design feature:

An electronic flight-control system requiring control-surface-position awareness.

Discussion

With a response-command type of flight-control system and no direct coupling from the cockpit controller to control surface, such as on the Boeing Model 777 and 787 airplanes, the pilot is not aware of the actual surface-deflection position during flight maneuvers. This feature of this design is novel and unusual when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. These special conditions are intended to contain the additional safety standard.

Some unusual flight conditions, arising from atmospheric conditions, or airplane or engine failures, or both, may result in full or nearly full control-surface deflection. Unless the flightcrew is made aware of excessive deflection or impending control-surface deflection limiting, piloted or the automated flight-control system control of the airplane

could be inadvertently continued in a way that would cause loss of control, or other unsafe handling or performance situations.

The special conditions require that suitable annunciation be provided to the flightcrew when a flight condition exists in which nearly full control-surface deflection occurs. Suitability of such an annunciation must take into account that some pilot-demanded maneuvers, such as a rapid roll, are necessarily associated with intended full or nearly full control-surface deflection. Simple alerting systems, which would function in both intended and unexpected control-limiting situations, must be properly balanced between providing needed crew awareness and avoiding nuisance warnings.

The special conditions are derived initially from standardized requirements the Aviation Rulemaking Advisory Committee (ARAC) developed, a committee comprising representatives of the FAA, Europe's Joint Aviation Authorities (now replaced by the European Aviation Safety Agency), and industry representatives. In the case of some of these requirements, a draft notice of proposed rulemaking has been prepared but no final rule has been issued.

The special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Discussion of Comments

The FAA issued Notice of Proposed Special Conditions No. 25-19-06-SC for the Boeing Model 777-9 airplane, which was published in the *Federal Register* on May 8, 2019 (84 FR 20053). No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Boeing Model 777-9 airplane. Should Boeing apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only a certain novel or unusual design feature on one model of airplane. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

Authority Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Boeing Model 777-9 airplanes.

In addition to compliance with §§ 25.143, 25.671, and 25.672, the following special conditions apply.

- (1) The system design must ensure that the flightcrew is made suitably aware whenever the primary control means nears the limit of control authority. This indication should direct the pilot to take appropriate action to avoid the unsafe condition in accordance with appropriate airplane flight manual instructions.

Depending on the application, suitable annunciations may include flight-deck control position, annunciator light, or surface position indicators. Furthermore, this requirement applies at limits of control authority, not necessarily at limits of any individual surface travel.

- (2) Suitability of such a display or alerting must take into account that some pilot-demanded maneuvers are necessarily associated with intended full performance, which may require full surface deflection. Therefore, simple alerting systems, which would function in both intended or unexpected control-limiting situations, must be properly balanced between needed flightcrew awareness and nuisance factors. A monitoring system, which might compare airplane motion, surface deflection, and pilot demand, could be useful for eliminating nuisance alerting.

Issued in Des Moines, Washington, on July 31, 2019.

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